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I, LEANNE MYNOTT, MANAGER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003906476 for a patent by SCHEFENACKER VISION SYSTEMS AUSTRALIA PTY LTD as filed on 24 November 2003.

WITNESS my hand this
Seventh day of December 2004

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PATENTS ACT 1990

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED:-

"CLUTCH ASSEMBLY"

This invention is described in the following statement:-

FIELD OF THE INVENTION

The present invention relates to drive trains for transmitting rotational movement from a motor to a drive element. In particular, the invention relates to "overload" clutch assemblies within such drive trains.

BACKGROUND

In many drive train applications overload relief is required. For instance, overload relief may be required to enable manual movement of a driven element without damaging the gear train. Coupling and isolation between the overload protected side of a mechanism and the driven side of a mechanism can be provided by a positive engagement clutch. Such clutches are known and used in automotive applications including external mirror head drives. The applicant's patent PCT/AU02/00517 titled "POWER FOLD MECHANISM FOR DOUBLE ARM MIRRORS" discloses a clutch that is held in an engaged position by a spring force and is disengaged when the reaction forces at ramps on the clutch are great enough to overcome the spring force.

A problem with clutch mechanisms of the type employed in the power fold mechanism disclosed in PCT/AU02/00517 is that significant frictional force is generated between the splines and the clutch body resisting movement of the clutch body with respect to the splines.

It is an object of the present invention to ameliorate the aforementioned problem and to provide a simpler clutch assembly.

It is a further object of the invention to provide a clutch and reduction drive assembly of reduced complexity.

SUMMARY OF THE INVENTION

According to the invention there is provided a clutch and reduction drive assembly comprising:

a first gear mounted to a first body for rotation about a first axis;

a second gear meshing with the first gear, the second gear mounted to a second body for rotation about a second axis; and

a clutch mechanism having a clutch body and a clutch body receiving portion, the receiving portion mounted to or integral with the second gear, the clutch mechanism preventing relative rotation between the clutch body and the second gear in an engaged position and allowing relative rotation between the clutch body and the second gear in a disengaged position,

characterised in that the clutch mechanism is disengagable by movement of the second gear together with the receiving portion with respect to both the clutch body and the first gear while the second gear remains meshing with the first gear, the movement in a direction along the second axis of rotation.

Preferably the clutch mechanism is loaded by a spring arrangement.

Preferably the clutch mechanism includes ramped detents on the clutch body bearing against corresponding detents on receiving portion,

whereby the ramped detents enable an axial force to be generated as the detents are rotationally forced against each other, the axial force overcoming the load on the clutch provided by the spring arrangement thereby enabling the clutch mechanism to disengage.

Preferably the first gear is a worm gear.

Preferably the worm gear is driven by a motor.

Preferably the motor is an electric motor.

The motor may either drive the worm gear directly or through a reduction gear drive which may include a further worm gear.

Preferably the spring arrangement comprises a disc spring and preferably the spring has a negative spring rate.

According to one aspect of the invention, the second gear is helically cut at an angle to match the worm gear so as to allow the first and second axes of rotation to be perpendicular to each other.

According to an alternative aspect of the invention, the second gear is straight cut and the first and second axes of rotation are not perpendicular to each other.

With this alternative embodiment of the invention, the movement of the second gear with respect to the clutch body in a direction along the second axis does not result in rotation of the second gear about the second axis.

The invention will find many applications. For instance an embodiment of the invention may include a vehicle sub-assembly such as an external mirror. With such an embodiment one of the first and second bodies would be connected to the vehicle body and the other of the first and second bodies would be connected to a driven component. For example, the driven component could be an externally mounted mirror head that is movable from a deployed position away from the vehicle side to a parked position adjacent the vehicle side under the action of the clutch and reduction drive assembly of the invention.

A specific embodiment of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. This embodiment is illustrative, and is not meant to be restrictive of the scope of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF THE INVENTION

A preferred embodiment of the invention is illustrated in the accompanying representations in which:

Figure 1 is a cut-away plan view of a clutch and reduction drive assembly according to an embodiment of the invention.

Figure 2 is a perspective view of parts of the assembly of Figure 1.

Figure 3 is a side view of the assembly shown in Figure 2.

Figure 4a is a magnified partial exploded view of the assembly shown in Figure 1.

Figure 4b is a partial exploded view of the assembly shown in Figure 1.

Figure 5 is a vertical cross-sectional view of the assembly shown in Figure 3 taken through section lines A-A indicated on Figure 3.

Figure 6 shows a power-folding external vehicle mirror assembly incorporating the assembly shown in Figures 1 to 5.

Figure 7 is an exploded view of the components of Figure 6.

Referring to Figure 1 and Figure 4a, a clutch and reduction drive assembly according to an embodiment of the invention is shown. The clutch and reduction drive assembly 17 comprises a first gear in the form of a drive worm 54 mounted to a first body in the form of a housing 40 for rotation about a first axis 51. A second gear referred to hereinafter as a drive gear 56 meshes with the drive worm 54. The drive gear 56 is mounted to a second body by upper and lower spacers 79 and 79' for rotation about a second axis 57 as indicated on Figure 1 and Figure 3. Depending on how the housing 40 and upper and lower spacers 79 and 79' are mounted, rotation of the drive gear 56 about the second axis 57 may occur either when the clutch is engaged or disengaged. The drive gear 56 has a clutch body receiving portion 61 integral with its upper face as is shown in Figure 4a. The receiving portion includes ramped detents 60 shaped to cooperate with clutch body 64. The clutch mechanism prevents relative rotation between the clutch body 64 and the drive gear 56 in an engaged position and allows relative rotation between the clutch body 64 and the drive gear 56 in a disengaged position.

The clutch body 64 has a key 65 that engages slots 79a and 79a' within the upper and lower spacers 79 and 79' to prevent relative rotation between those two parts. Key 65 and slot 79a' are clearly shown in Figure 4b.

In other embodiments of the invention the receiving portion may be a separate component to the drive gear.

The clutch mechanism is loaded by a spring arrangement in the form a disc spring 70 shown in Figures 4 and 5. This spring 70 biases the drive gear 56 upward into engagement with the clutch body 64. The ramped detents 60 enable an axial force to be generated as the detents are rotationally forced against each other. When the axial force is sufficient to overcome the load on the clutch provided by the spring 70, the clutch mechanism disengages thereby allowing the drive gear 56 to rotate with respect to the clutch body 64 and the upper and lower spacers 79 and 79'.

Referring to Figure 4a it can be seen that the clutch and reduction drive assembly 17 is driven by an electric motor 46 driving the motor worm which in turn drives a motor worm driven gear 50 which is fixed to the drive worm 54. The drive worm 54 meshes with the drive gear 56.

With this embodiment of the invention, the second gear, that is the drive gear 56 is helically cut at an angle to match the worm gear 54 so as to allow the first and second axis of rotation 51 and 57 to be perpendicular to each other. With this arrangement, the drive gear 56 will advance or retard with respect to the drive worm 54 (depending on the hand of the worm) as the clutch is moved from an engaged to a disengaged position. To maintain equal disengagement torque in either rotational directions, different ramp angles on the faces of the detents 60 are used.

In an alternative embodiment of the invention the drive gear 56 is straight cut and the first and second axes of rotation 51 and 57 are not perpendicular to each other. With this alternative arrangement, no advancing or retarding of the drive gear occurs, however more space is required to accommodate the drive components.

The disc or belleville spring 70 can be replaced with a conventional coil spring or any other biasing arrangement.

The clutch and reduction drive assembly 17 described above will have many applications. In automotive components such as mirrors there is a need to provide motor driven components with the ability to be manually overridden without

damage of a gear train. A particular example of this is a power folding truck "wing" mirror illustrated in Figures 6 and 7. Figure 6 shows an external side or "wing" mirror assembly 11 comprising a head portion 12 and two mirrors 13. The mirror assembly 11 has a base assembly 14 with upper and lower mirror arms 15 and 16 respectively extending from the base assembly 14 to the head portion 12. Each arm 15 and 16 has a clutch and reduction drive assembly 17 mounted within it. The clutch and reduction drive assembly 17 are mounted into the base assembly 14 by means of bolts 26 through the upper and lower spacers 79 and 79' as shown in Figures 7 and 2.

As can be seen in the sectional view of Figure 5 (taken through section lines A-A indicated in Figure 3) the housing 40 (having a lower portion 40') is securely held within mirror arm 15. Thus the axis 51 about which the drive worm 54 rotates is fixed with respect to the mirror arm 15 and the head portion 12. Therefore, while the clutch remains engaged, rotation of the drive worm 54 causes the housing 40 and the mirror arm 15 and head portion 12 to rotate about the drive gear axis 57. If a person manually rotates the head portion 12 about the drive axis 57, for instance to manually park the mirror head, because the drive worm 54 is by its nature non-back drivable, the drive gear 56 will be forced to rotate with respect to the clutch body 64. This is possible because of the ramp detents between these two components.

Arm covers or shrouds 22 enclose the assembly 17 to protect it and provide an aesthetically pleasing appearance as shown in Figures 5 and 6.

Many other applications for the clutch and reduction drive assembly 17 described above will exist. In some applications, the first gear may not be a drive worm 54 but instead may be a spur or helically cut gear 54 (not shown). In applications where no reduction is required and only clutching is required, the first gear may have the same pitch circle diameter as the second gear (the drive gear 56).

In the embodiments described above, drive input is through the first gear (the worm 54) with rotation of the housing 40 about the axis 100 of bolt 44 comprising the

output. The axis of rotation 100 is illustrated in Figure 5. In other embodiments the drive may be reversed with the worm 54 replaced by an output helical or spur gear and input being provided by rotation of the bolt 44 and hence the clutch body 64 about the axis 100.

While the present invention has been described in terms of a preferred embodiment, in order to facilitate better understanding of the invention, it should be appreciated that various modifications can be made without departing from the principles of the invention. Therefore, the invention should be understood to include all such modifications within its scope.

DATED this 24th day of November, 2003.

Schefenacker Vision Systems Australia Pty Ltd
By its Patent Attorneys
MADDERNS

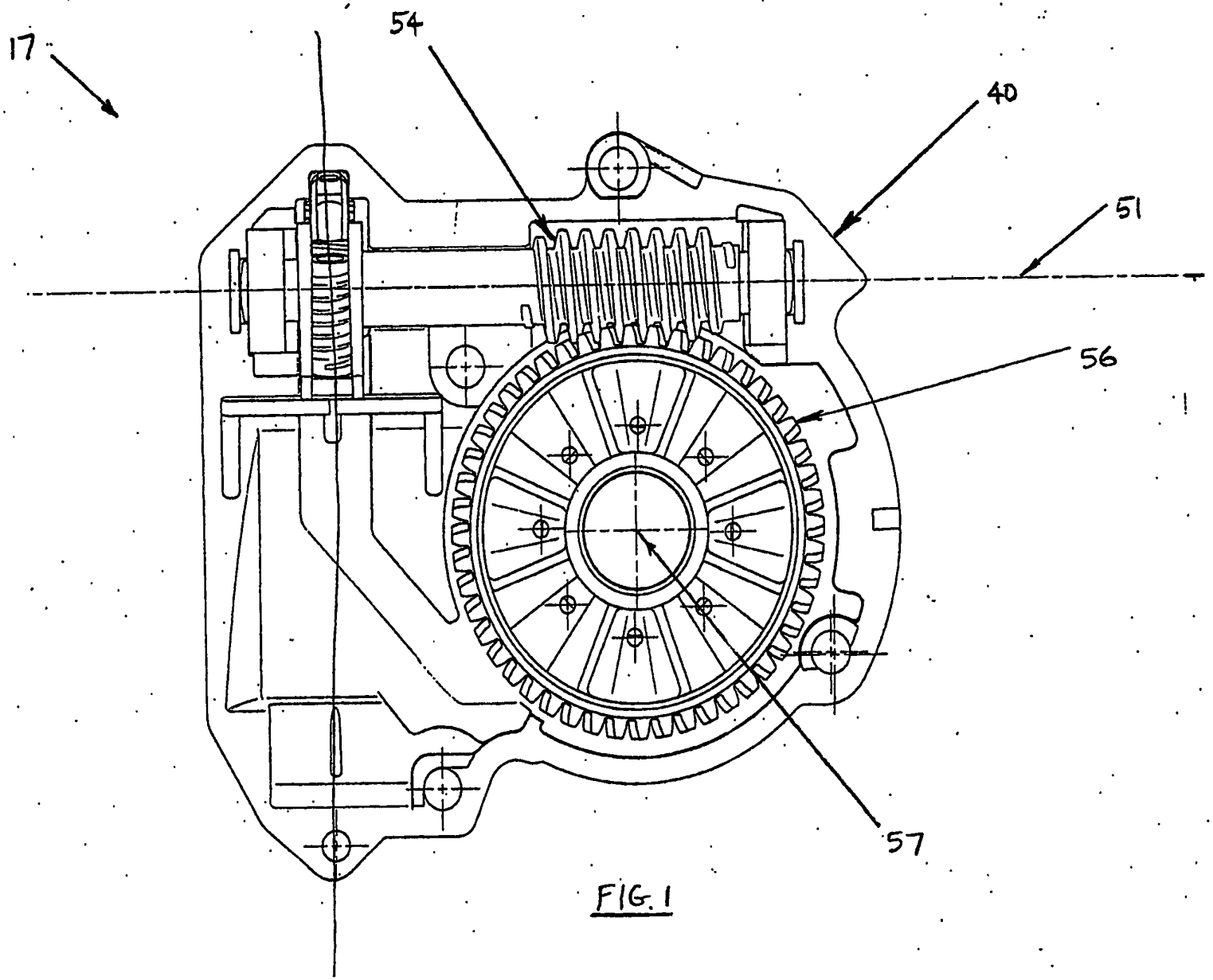

FIG. 1

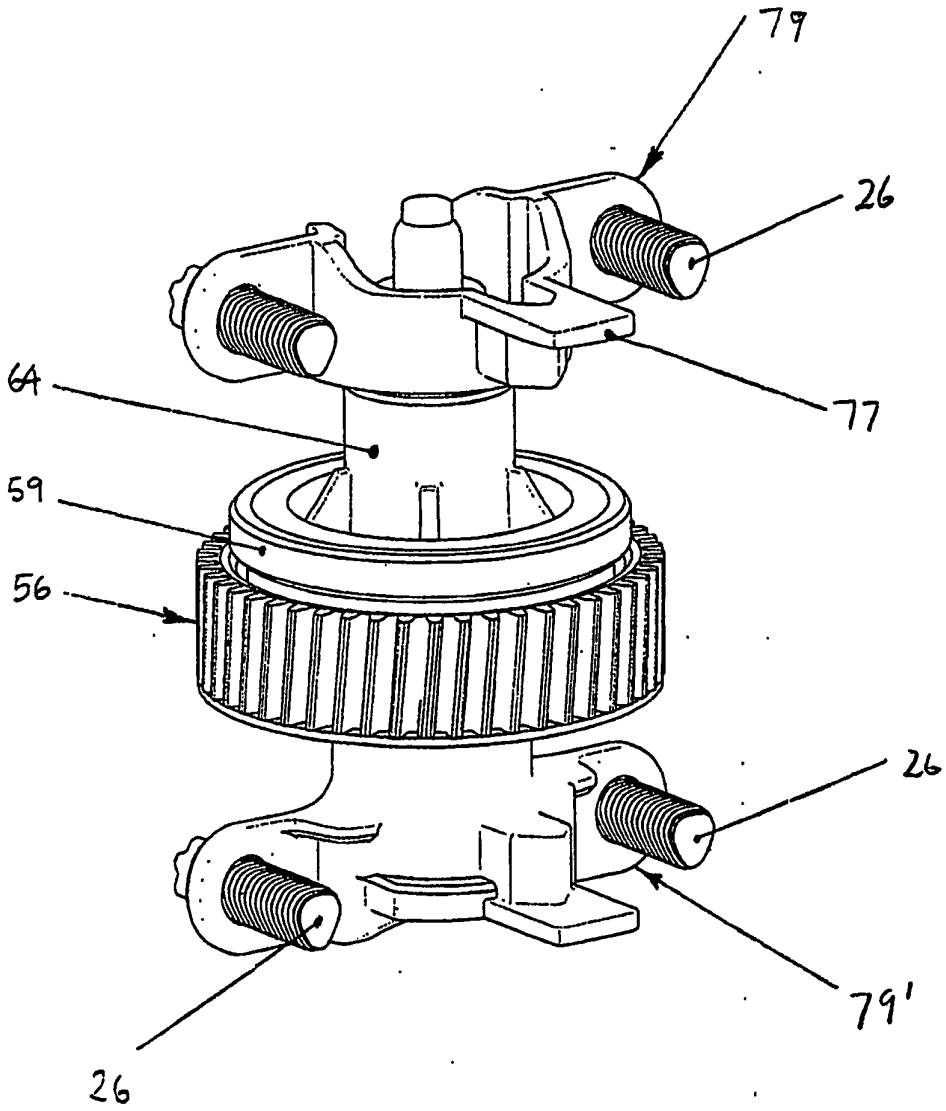

FIG. 2

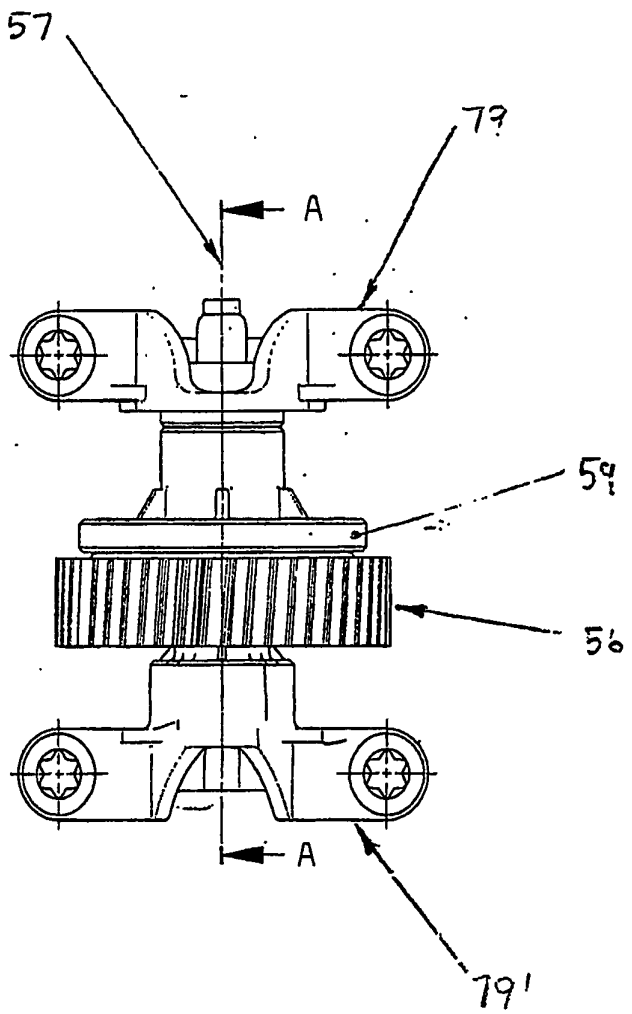

FIG. 3

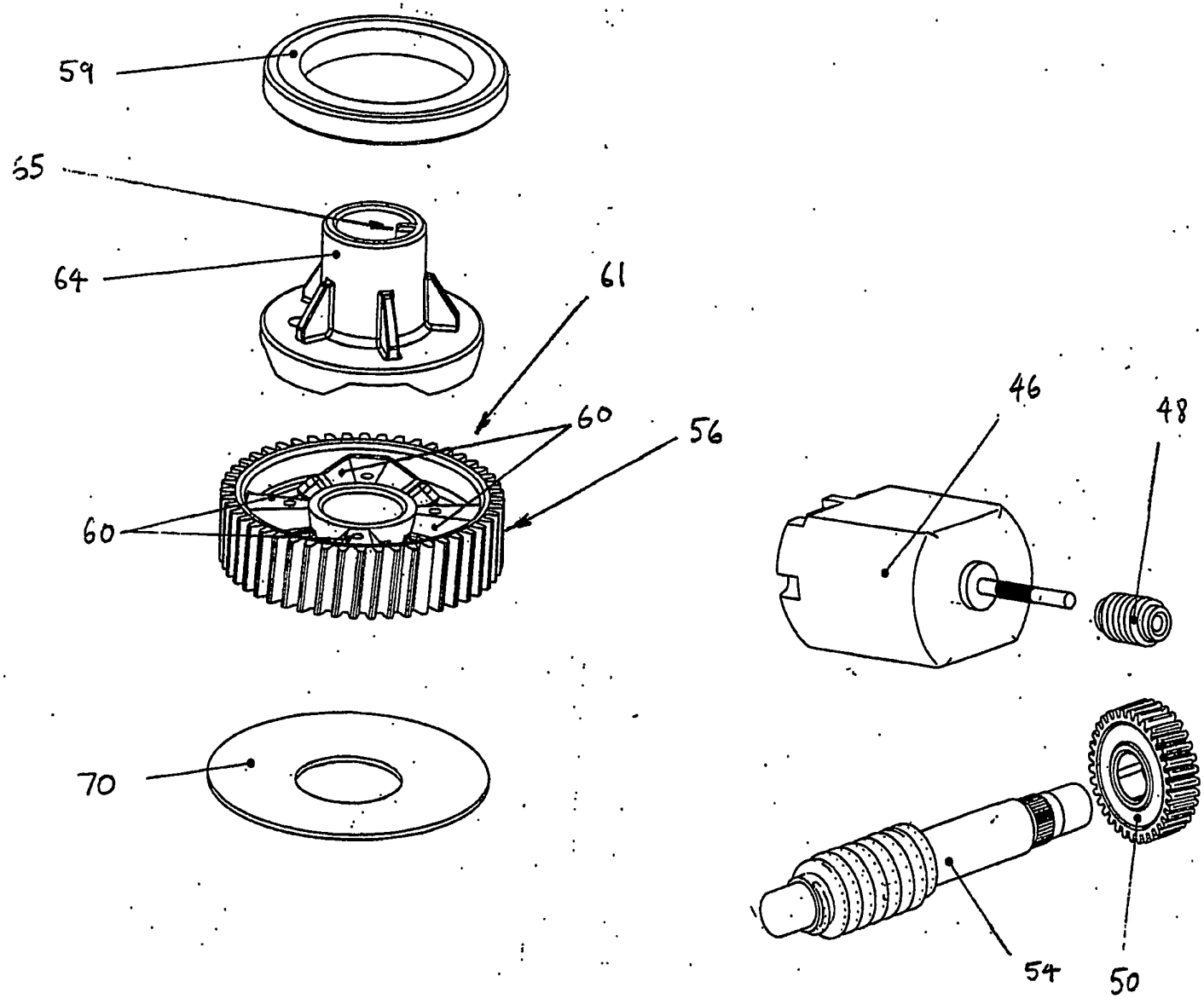

FIG. 4a

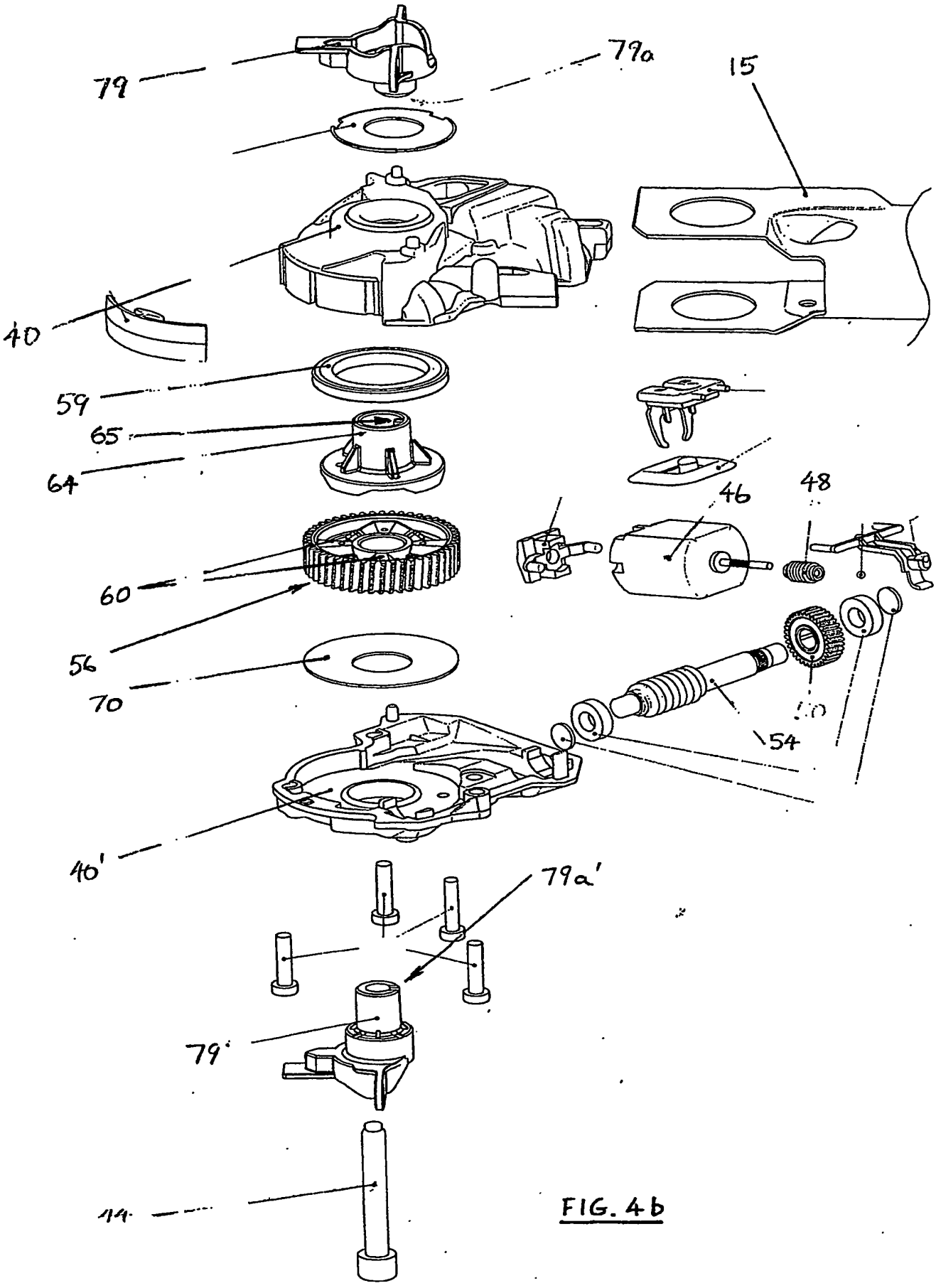

FIG. 4b

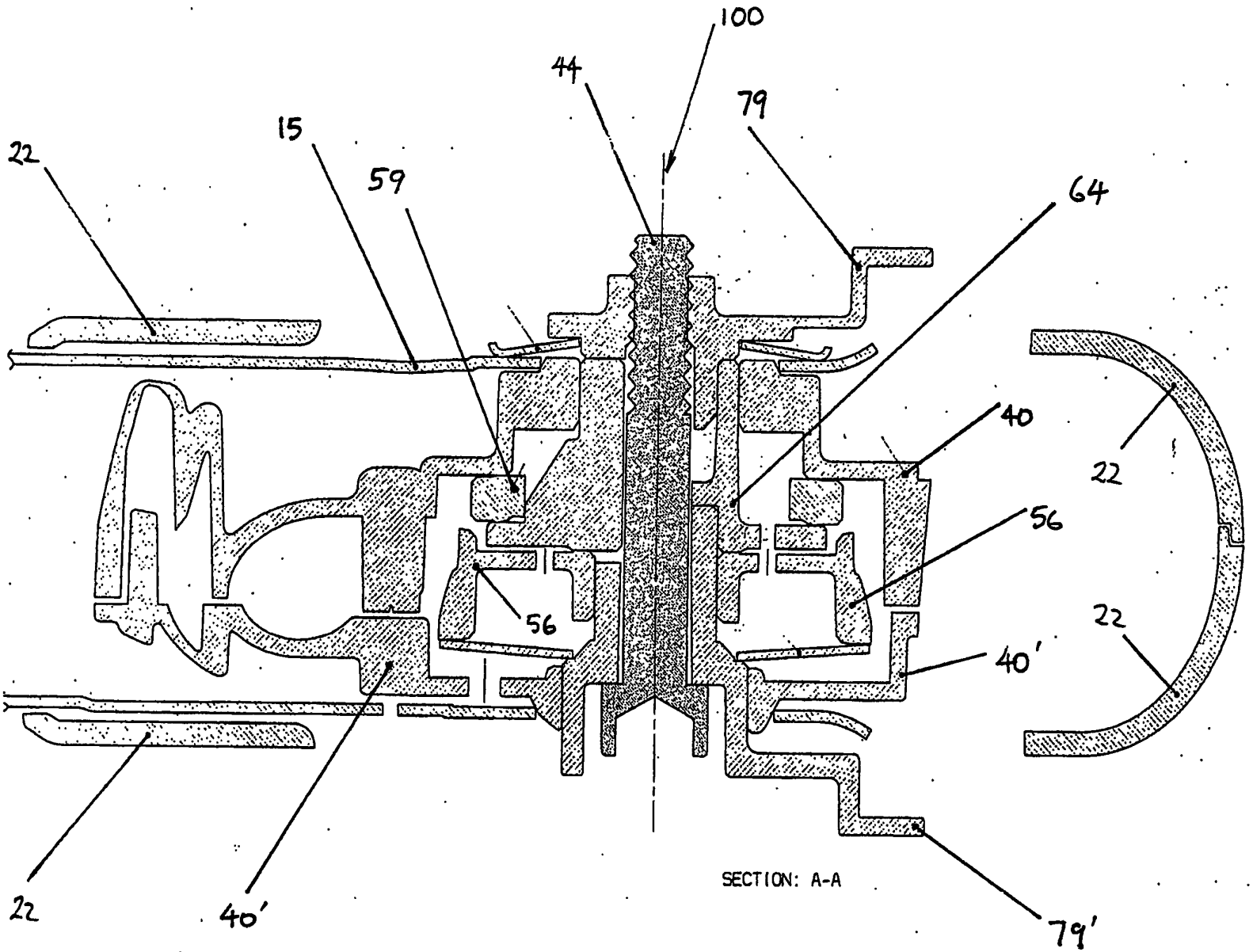

FIG. 5

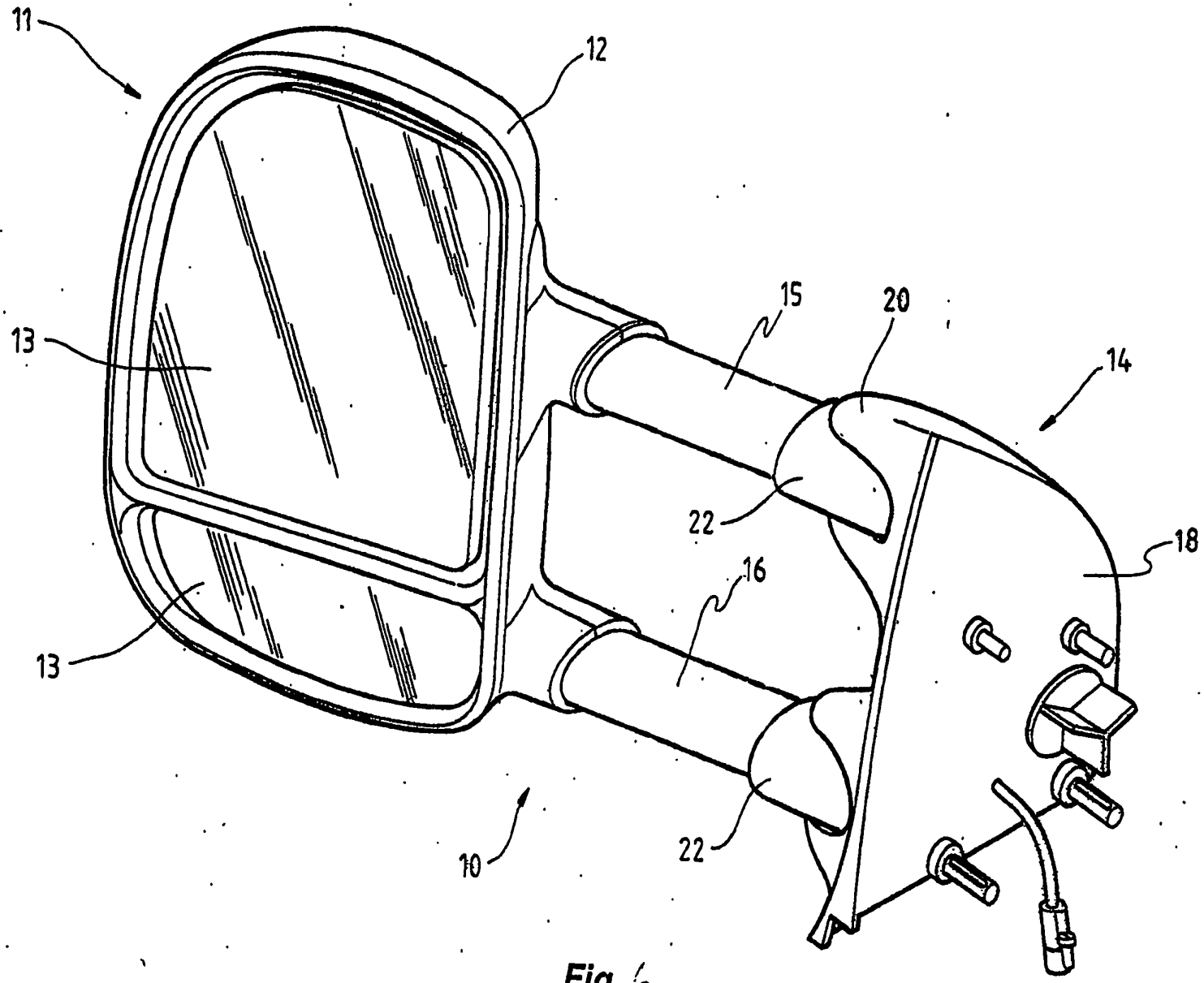

Fig. 6

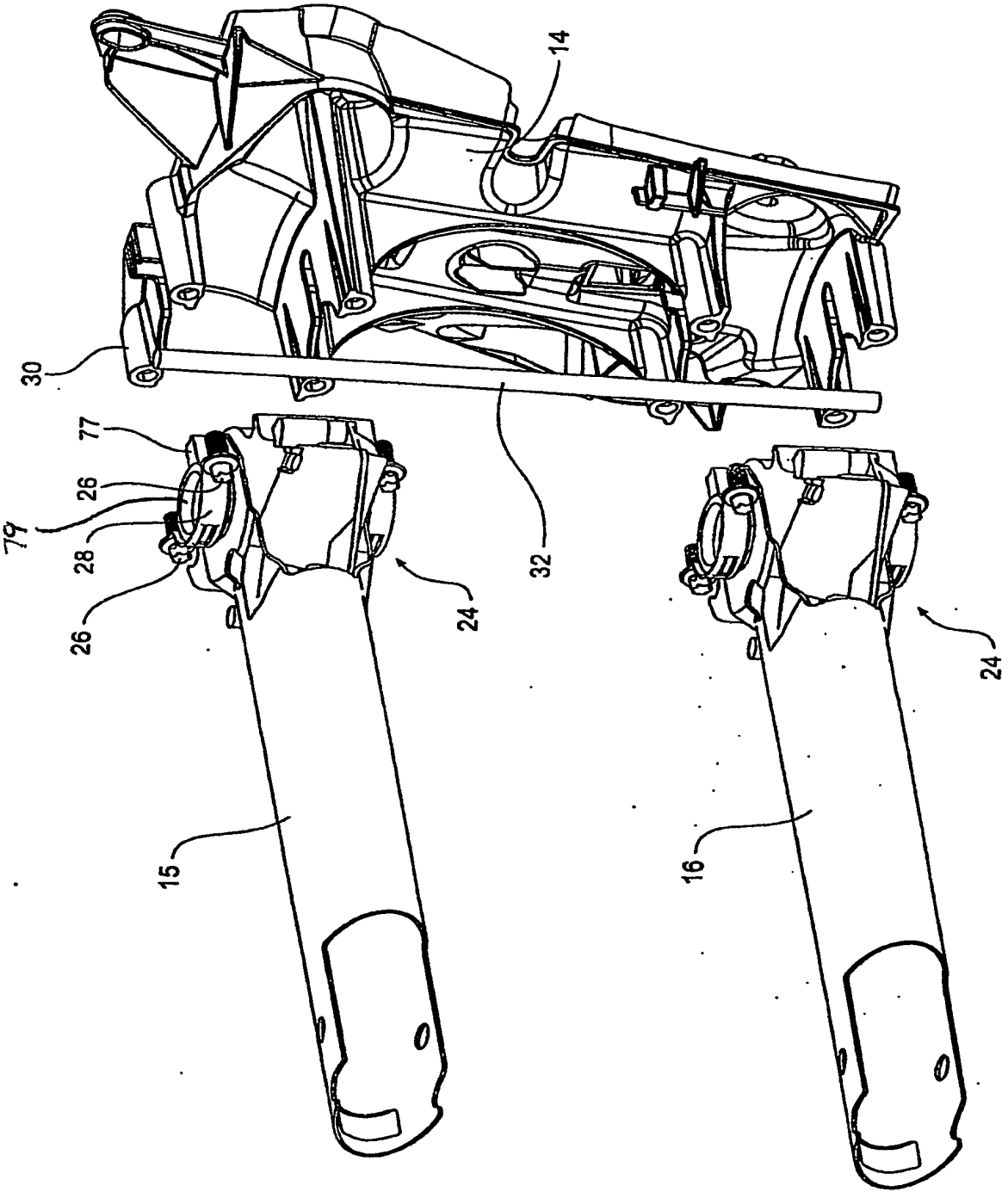

Fig. 7

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